Management and Outcome of Retroperitoneal Abscesses

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Retroperitoneal space abscesses are unusual clinical problems encountered by general surgeons, internists, and surgical subspecialists. An insidious, occult illness marked by diagnostic delay, inadequate drainage, and considerable morbidity and mortality is common. Anatomic reviews detailing the complex extraperitoneal spaces have been published, but less attention has been focused on diagnostic and drainage techniques useful to the practicing surgeon. In a retrospective review of 50 extraperitoneal abscesses, attention was directed to clinical presentation, diagnosis, and therapy. On the average, 12.7 days were required to establish the diagnosis; 50% of patients suffered major complications. A strikingly high mortality was associated with positive blood cultures and persistent fever within 48 hours of drainage (75% and 71%, respectively). Computed tomography has greatly enhanced the diagnosis of extraperitoneal abscesses, and radiologic drainage in selected cases appears to be a useful initial approach. A simplified anatomic classification and treatment plan is proposed to facilitate comparison between clinical series.

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EXTRAPERITONEAL ABSCESSES localized to the retroperitoneum and/or pelvis are uncommonly encountered clinical entities. Unlike the intraperitoneal region that is accessible to auscultation, percussion, and palpation, the retroperitoneal compartments are relatively "hidden" to the examiner. In addition, unlike the intraperitoneal tissues, those of the extraperitoneum may demonstrate little visible reaction to bacterial contamination. An insidious, occult, and prolonged illness usually ensues. Diagnostic delay and inadequate drainage are common, resulting in prolonged sepsis and associated high morbidity and mortality.

Altemeier and Alexander[1] described the extraperitoneal compartments above the pelvic brim. They divided the retroperitoneum into retrofascial and anterior and posterior divisions, the latter having divisions of lateral, anterior, and posterior components. Stevenson and Ozeran[2] expanded the description by subdividing the anatomy of the extraperitoneal pelvis into posterior, anterior, inferior, and superior spaces. More recent reviews by Meyers[3] and Simons et al.[4] provide more complete anatomic, functional, and radiologic descriptions. Although these reviews discuss the importance of prompt diagnosis and surgical drainage, the anatomic divisions are difficult to apply in practice.

To clarify the clinicoanatomic analysis of these abscesses, we have developed a simplified classification consisting of five components: (1) perinephric, (2) upper retroperitoneal (*i.e.*, above the pelvic brim), (3) pelvic, (4) combined upper retroperitoneal and pelvic, and (5) localized musculoskeletal (*e.g.*, confined to the iliacus, psoas, or gluteus muscles) (Fig. 1). In this review of 50 cases of isolated extraperitoneal abscesses, an effort is made to identify factors affecting outcome.

Patients and Methods

The medical records of 50 patients seen at Hartford Hospital between 1971 and 1983 with the diagnoses of extraperitoneal abscesses of the posterior abdomen and pelvis confirmed at operation or autopsy were reviewed retrospectively. Patients with a concurrent intraperitoneal abscess were excluded. Twenty-four patients (48%) were men and 26 (52%) were women. Although 48% of patients were more than 60 years old, all ages were involved (Fig. 2). Clinical data, with emphasis on abscess location, treatment, complications, and outcome, were analyzed.

Results

A majority of patients, 36 of 50 (72%), had conditions associated with depressed immune status (Table 1).

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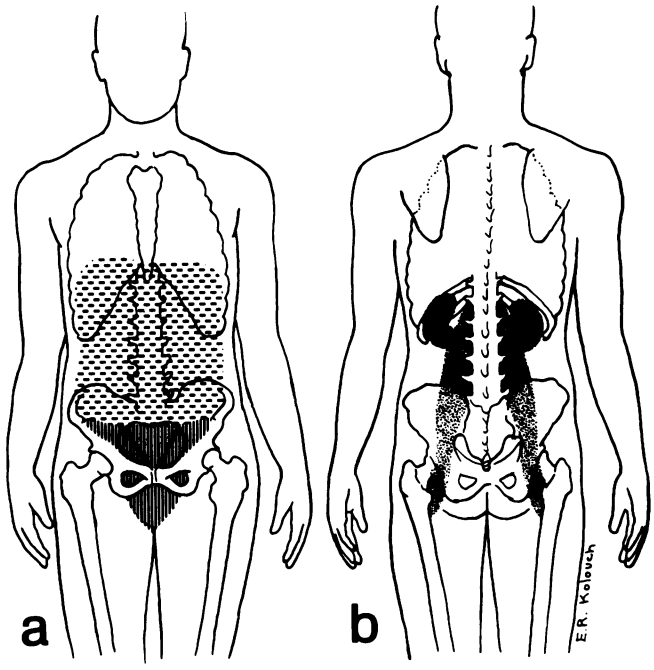

FIG. 1. Anatomic regions described in simplified classification. Anterior view (a) shows upper retroperitoneal and pelvic regions. From posterior view (b), perinephric and localized musculoskeletal collections are visible. Combined abscesses involve both the upper retroperitoneum and the pelvis.

TABLE 1. *Associated Medical Illnesses*

Medical Problem	No. of Patients
Diabetes mellitus	11 (22%)
Alcoholism/cirrhosis	11 (22%)
Malignancy (colorectal, cervical, bladder, leukemia)	8 (16%)
Remote infection	6 (12%)
Glucocorticoid intake	6 (12%)
Chronic renal failure	3 (6%)
Other	4 (8%)

TABLE 2. *Frequent Symptoms*

Symptom	N
Pain	31 (62%)
Vomiting/altered bowel habits	17 (34%)
Sweats/fever	16 (32%)
Malaise	11 (22%)
Chills	10 (20%)
Weight loss	6 (12%)

Symptoms typically included nonspecific, nonlocalized abdominal pain and variable gastrointestinal complaints and constitutional symptoms, such as chills, sweating, fever, or malaise (Table 2). Five patients (10%) were asymptomatic. Patients with psoas abscesses complained of referred pain to the hip, groin, or knee.[5] The duration of these symptoms was greater than 1 week in 68%, and greater than 1 month in 16% (Fig. 3). One patient with a large presacral abscess complained of 10 months of pelvic and low back pain after an abdominoperineal resection.

Physical examination revealed mild, localized tenderness in 78%, and a suggestion of a mass in 38% (Table 3). Fever was present in 41 patients (82%); temperature was greater than 101 F in 33 patients.

Laboratory studies were not helpful in establishing the diagnosis or in planning therapy. Despite a high incidence of renal disease, the urine sediment was unremarkable[1] (Table 4). Two diabetic patients had diabetic ketoacidosis.

Radiologic studies other than computed tomography relied heavily on indirect evidence of "mass effect." Consequently, multiple tests were necessary to confirm the

FIG. 2. Age distribution.

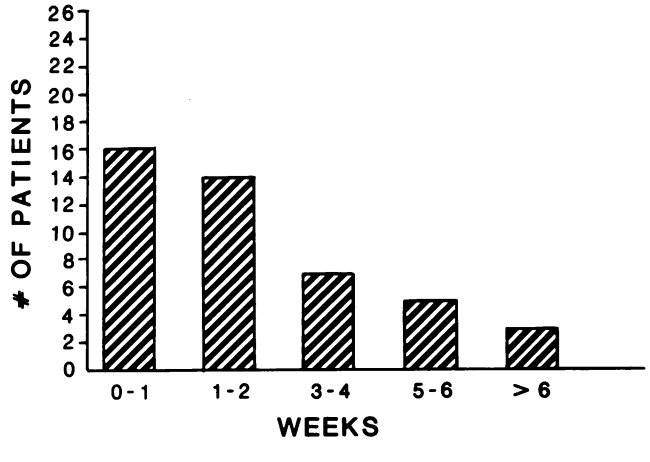

FIG. 3. Symptom duration before hospitalization.

TABLE 3. *Physical Findings*

Symptom	N
Fever	41 (82%)
Tenderness	39 (78%)
Abdominal	34 (68%)
Rectal	5 (10%)
Mass	19 (38%)
Shock	3 (6%)
Psoas sign	2 (4%)

TABLE 4. *Admission Laboratory Studies*

Laboratory Values	% of Total
White blood count	
$<10{,}000/mm^3$	31
$10–20{,}000/mm^3$	47
$>20{,}000/mm^3$	22
Elevated erythrocyte sedimentation rate	24
Urinalysis	
>10 WBC/high power field	16
Hyperglycemia	10

TABLE 6. *Causes of Abscesses*

	%
Renal disease	22
Postoperative	22
Idiopathic/remote infection	12
Trauma	12
Cancer	10
Diverticulitis	8
Crohn's disease	8
Pancreatitis	6

TABLE 7. *Complications and Mortality*

Complication	Incidence	Associated Mortality
Pneumonia/respiratory failure	20%	80%
Recurrent abscess	16%	13%
Renal failure	12%	67%
Cardiac	8%	75%
Coloenteric fistula	6%	33%

diagnosis and to delineate anatomy, extending the treatment delay. The sensitivity of various diagnostic tests in abscess detection is summarized in Table 5.

The mean interval between admission and diagnosis was 12.7 days. Perinephric abscesses were diagnosed earlier, an average of 4.4 days after admission. Postoperative abscesses or abscesses related to the gastrointestinal tract were detected an average of 15.1 days after hospitalization. Nearly half the abscesses either followed renal disorders or occurred in the postoperative period (Table 6). Pancreatitis was rarely implicated since concurrent intra-abdominal abscesses usually occurred with this disease.

One or more major complications developed in 26 patients (52%) (Table 7). The most frequent complication was pneumonia and respiratory failure, with an associated mortality rate of 80%. Following recurrent abscess and renal failure, there were 14 other major system complications contributing to long-term morbidity and mortality. Among the sequelae were deep venous thrombosis, upper gastrointestinal bleeding, small bowel obstruction, arterial thrombosis, and urinary tract infection (4% each); and brain abscess, empyema, osteomyelitis, acute cholecystitis, hernia at drain site, splenic hemorrhage, and central venous pressure line sepsis (2% each).

Positive blood cultures were found in 12 patients (24%); nine of these patients died (75%) in contrast to four of 38 nonbacteremic patients ($p < 0.001$, Fisher's exact test). A variety of organisms were cultured. *Escherichia coli* and *Bacteroides* sp. were most frequently present, but 14 different organisms were found. Fifty-seven per cent of these cultures were monomicrobic (Table 8).

In patients with preoperative fever, the number of days required to defervesce postdrainage was a significant prognostic indicator. Those patients whose temperature fell below 100 F in less than 3 days had an 89% survival rate. Those who remained febrile for more than 4 days postdrainage had a 71% mortality rate ($p < 0.05$). Patients

TABLE 5. *Radiologic Studies*

	No. of Tests	No. Positive	Sensitivity (%)
CT scan	5	5	100
Retrograde ureterogram	5	4	80
Sinogram	14	11	78
Gallium scan	10	7	70
Ultrasonography	6	4	67
Intravenous pyelogram	26	17	65
Barium enema	19	10	52
Angiogram	6	3	50
Upper gastrointestinal series	19	8	42
Plain abdominal film	46	12	26
Chest x-ray	46	11	24
Liver/spleen scan	10	1	10
Bone scan	5	0	0

TABLE 8. *Micro-organisms and Mortality**

Organism	Patients with Positive Blood Cultures		
	Blood	Wound	Urine
E. coli	5 (100%)	17 (29%)	10 (40%)
Bacteroides	3 (100%)	7 (41%)	0
Staphylococcus aureus	1 (0%)	8 (0%)	1 (0%)
Peptostreptococcus	1 (0%)	5 (20%)	0
Enterococcus	1 (100%)	3 (33%)	0
Enterobacter	1 (0%)	2 (0%)	0

* Mortality rates in parentheses.

TABLE 9. *Anatomic Locations of Abscesses*

	%
Perinephric	26
Upper retroperitoneum	20
Pelvic	12
Combined upper retroperitoneum and pelvic	40
Localized musculoskeletal	2

who did not defervesce had inadequate dependent drainage and death from persistent sepsis.

The anatomic locations of abscesses by percentage are summarized in Table 9 (see Fig. 1). No perinephric abscess invaded any of the other spaces, being confined by Gerota's fascia in every case.

Treatment was usually operative in conjunction with intravenous antibiotic therapy. The retroperitoneal approach (flank incision) and the pelvic approach (presacral incision) were more effective than the transperitoneal route ($p < 0.001$) (Table 10). Nonoperative therapy was used in four instances; it was successful twice because of spontaneous, dependent drainage. The remaining patients were not considered surgical candidates.

The mortality rate was 26%. Eighty-five per cent of the deaths occurred in the hospital during the first admission, whereas 15% of the patients who died were readmitted with recurrent sepsis.

Discussion

Infections of the retroperitoneal space have troubled physicians in all disciplines for decades, as witnessed by long delays in diagnosis (12.7 days in this report) and a high mortality rate varying from 22–46%,[5] 26% in this series. The retroperitoneum is a potential space with clearly defined boundaries: between the peritoneum and transversalis fascia lining the posterior abdominal cavity, extending laterally to the edges of the quadratus lumborum muscles, the diaphragms superiorly, and the pelvis inferiorly.[1,2] While abscesses of renal origin as a rule were confined to Gerota's fascia in this series, others were large, containing up to 2000 ccs, and most surgeons could not define anatomically discrete compartments containing pus.

TABLE 10. *Therapeutic Approaches*

	No. of Patients	Successful*
Operative	46 (92%)	
Retroperitoneal drainage	28 (56%)	85%
Transperitoneal drainage	16 (32%)	33%
Pelvic (presacral) drainage	6 (12%)	100%
Nonoperative	4 (8%)	50%

* Patients survived and required no further operations.

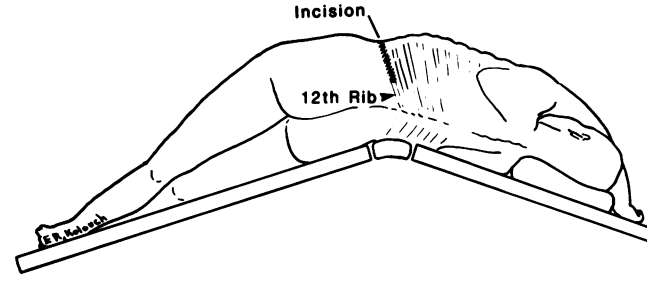

FIG. 4. A retroperitoneal flank incision is used for perinephric, musculoskeletal, and upper retroperitoneal infections.

Transperitoneal drainage should be carefully avoided if possible. In our experience, this approach was associated with a 67% failure rate (*i.e.*, mortality or recurrent abscess). Perinephric and upper retroperitoneal abscesses are drained definitively *via* extraperitoneal flank incisions (Fig. 4). We noted only a 15% failure rate in 28 such cases and no failures after pelvic abscess drainage between the anus and coccyx (Fig. 5). As pointed out by Maull,[6] "pus obeys the law of gravity." Clinical evidence of effective drainage is quickly confirmed by defervescence in less than 48 hours.

The retroperitoneum can be seeded by infections involving numerous organs. The kidneys, ureters, pancreas, abdominal aorta, and inferior vena cava are wholly contained in the retroperitoneum. The ascending colon, descending colon, and duodenum are contiguous with it. The bladder, uterus, and rectum are located in the pelvic extraperitoneal space. Known causes of isolated retroperitoneal abscess include osteomyelitis,[7] seeding of posttraumatic pelvic hematomas,[8] postradiation,[9] perforated appendicitis,[10–12] toothpick perforations,[13,14] perforated colon carcinoma,[15,16] diverticulitis,[17] Crohn's disease,[18–22] cryptogenic and iatrogenic factors,[23–27] acute cholecystitis,[28] and pancreatitis.[29,30] The most common causes of isolated retroperitoneal abscess in this series were renal disease and postoperative infections. Of note was the ab-

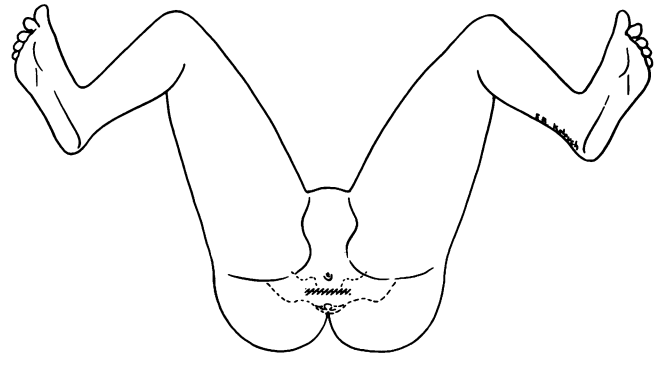

FIG. 5. Pelvic abscesses are drained dependently between the anus and coccyx.

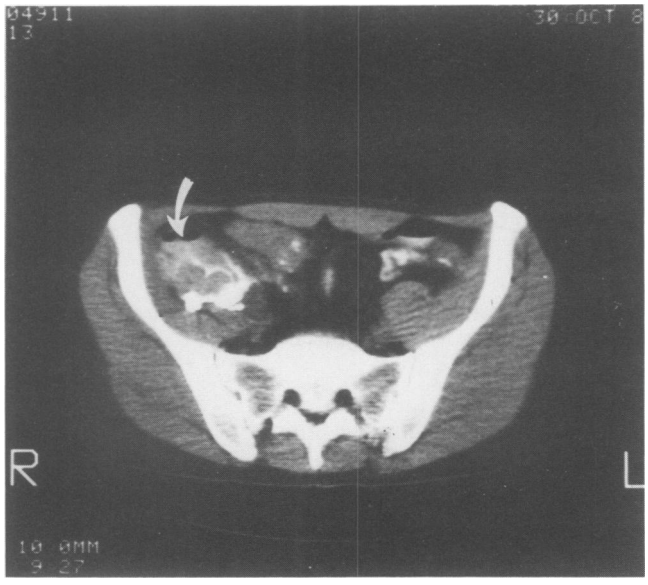

FIG. 6. CT scan clearly defines retroperitoneal abscess (arrow) from Crohn's disease that tracked down the psoas muscle into the groin.

sence of any cases of tuberculous abscess (formerly a frequent cause),[1,31] and the rarity of psoas abscesses, which are often secondary to retroperitoneal pathology or bony infection.[32-38]

Over half of the patients were more than fifty years of age. Not surprisingly, associated conditions rendering them more susceptible to infection were common. Diabetes mellitus, alcohol abuse, malignancy, and glucocorticoid intake served to mask the infections by impairing host response. A baseline debilitated state coupled with extensive infection predisposed to a high rate of abscess-related complications, 52% in our series.

The relatively inaccessible location of the retroperitoneal space does not readily lend itself to physical examination. Laboratory studies are of little value in specifying the diagnosis. Radiologic studies have always been the cornerstone of diagnosis of extraperitoneal infection. "Positive studies" have traditionally relied on indirect evidence of neighboring inflammation or mass effect, with a very low sensitivity. The introduction of computed tomography has greatly improved diagnostic accuracy. Computed tomography is particularly useful for evaluation of the retrofascial musculature[39-42] and the perirenal compartments.[43,44] Some pitfalls of computed tomography, however, have been recognized.[45] In our series, five patients had computed tomography and the diagnosis was established 100% of the time (Fig. 6).

Precise anatomic delineation is useful in directly assessing the extent of infection and in planning a surgical approach. All abscess loculations must be broken up and the limits of the abscess defined. In addition, recent reports in the radiologic literature describing pigtail catheter drainage of intra-abdominal abscesses, some of which have been retroperitoneal, have demonstrated success rates of over 90% in selected cases.[46-49] We have a limited, but positive, experience with this technique. If the abscess is unilocular, relatively free of particulate matter, and safely approachable, pigtail drainage is attempted as an initial therapeutic maneuver. Surgical drainage can always be instituted later if prompt defervescence does not occur.

Isolated infections of the extraperitoneal space are often occult and unsuspected for days after hospital admission. More efficient diagnosis and, therefore, more prompt surgical drainage afforded by computed tomography should lower the associated high morbidity and mortality in coming years. Successful treatment requires dependent drainage that does not contaminate the retroperitoneal space. This is best accomplished by a flank approach in the case of upper retroperitoneal and perirenal infections and by a presacral approach for pelvic infections.

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